

Claims

1. Sheet-processing machine comprising a plurality of modules (04; 08; 31; 47; 51; 54) which are passed through one after the other by the sheets to be processed, having a sheet feeder module (01; 04; 07) for feeding the sheets to a downstream sheet-processing module (08; 31; 47; 51; 54), wherein the sheet input interface (17; 32; 49; 52; 56) and the sheet output interface (36, 53; 57) of at least one of the sheet-processing modules (08; 31; 47; 51; 54) can optionally be coupled to sheet output interfaces (07, 36, 53; 57) and sheet input interfaces (17; 32; 49; 52; 56), respectively, of at least two other modules (01; 04; 08; 31; 47; 51; 54), characterized in that the sheet-processing modules optionally comprise one or more of the following modules:

- an inspection module (31) for monitoring the print quality of the sheets;
- a marking module (47) for marking a sheet as usable or unusable depending on a monitoring result of the inspection module (31); and

- a numbering module (08) for applying serial numbering to the sheets,

and in that the modules are provided in such a way that the following machine assemblies can optionally be formed:

- a first assembly comprising a sheet feeder module (01; 04; 07) and a numbering module (08) connected in succession;

- a second assembly comprising a sheet feeder module (01; 04; 07), an inspection module (31) and a numbering module (08) connected in succession; and

- a third assembly comprising a sheet feeder module (01; 04; 07), an inspection module (31) and a marking module (47) connected in succession.

2. Sheet-processing machine according to claim 1, characterized in that each of the interfaces have

respective transport cylinders (07; 17; 32; 36; 49; 52; 53; 56; 57) for receiving a sheet from an output transport cylinder (07; 36; 53; 57) of an upstream module (04; 31; 51; 54) or for passing a sheet to an input transport cylinder (17; 32; 49; 52; 56) of a downstream module (08; 31; 51; 54).

3. Sheet-processing machine according to claim 2, characterized in that a sheet transport path within a module (31; 51; 54), which has a sheet input interface that can be connected to a number of sheet output interfaces, is formed by an even number of transport cylinders (32, 33, 34, 36; 52, 53; 56, 57).

4. Sheet-processing machine according to claim 2 or 3, characterized in that the output transport cylinder (07; 36; 53; 57) of an upstream module (04; 31; 51; 54) and the input transport cylinder (17; 32; 39; 52; 56) of a downstream module (08; 31; 51; 54) have opposite directions of rotation.

5. Sheet-processing machine according to claim 1, characterized in that the modules (04; 08; 31; 47; 51; 54) have their own respective side frame panels (09; 11; 13; 30; 50; 58; 59).

6. Sheet-processing machine according to claims 2 and 5, characterized in that the transport cylinders (07; 32; 33; 34; 36; 49; 52; 53; 56; 57) are fixed to the side frame panels (09; 11; 13; 30; 50; 58; 59).

7. Sheet-processing machine according to claim 5, characterized in that the side frame panels (09; 11; 13; 30; 50; 58; 59) of the individual modules (04; 08; 31; 47; 51; 54) are fixed to one another.

8. Sheet-processing machine according to claim 5, 6 or 7, characterized in that the modules (04; 08; 31; 47; 51;

54) have a cut-out in which the side frame panels (09; 11; 13; 30; 50; 58; 59) of the modules (04; 08; 31; 47; 51; 54) can engage and be supported.

9. Sheet-processing machine according to claim 16, characterized in that columns (35) can be provided for supporting the modules (04; 31; 51; 56).

10. Sheet-processing machine according to claim 1, characterized in that the numbering module (08) is arranged behind the inspection module (31) in the conveying direction of the sheets, so as to apply the numbering only to those sheets which have passed the quality check carried out by the inspection module (31).

11. Sheet-processing machine according to claim 1, characterized in that a marking device (46) is arranged in the numbering module (08).

12. Sheet-processing machine according to claim 1, characterized in that a marking device (46) is arranged upstream of a numbering unit (21; 22).

13. Sheet-processing machine according to claim 1, characterized in that a marking device (46) is arranged on a counter-pressure cylinder (18) of a numbering unit (21; 22).

14. Sheet-processing machine according to claim 1, characterized in that a marking device (46) marks an edge region of a column and/or row in which the fault is located.

15. Sheet-processing machine according to claim 1, characterized in that a marking device (46) marks a column and outputs the row number in which the faulty printing is located.

16. Sheet-processing machine according to claim 1, characterized in that the marking module (47) comprises a marking device (46) for applying a marking to sheets.

17. Sheet-processing machine according to any of claims 11 to 16, characterized in that the marking device (46) is arranged to apply the marking as unusable selectively to individual copies or in relation to individual copies on a sheet.

18. Sheet-processing machine according to any one of claims 11 to 16, characterized in that the marking device (46) comprises a plurality of print heads which are distributed uniformly in the direction transverse to the transport direction of the sheets.

19. Sheet-processing machine according to any one of claims 11 to 16, characterized in that the marking device (46) is an inkjet printing unit.

20. Sheet-processing machine according to claim 1, characterized in that a transport module (51) is provided.

21. Sheet-processing machine according to claim 1, characterized in that an expansion module (54) is provided.

22. Sheet-processing machine according to claim 1, characterized in that an inking unit module (12) is provided which, in conjunction with another module (08; 47; 51), forms a printing module (8, 12, 16; 47, 12, 16; 51, 12, 16).

23. Sheet-processing machine according to claim 14, characterized in that inking unit rollers of the inking unit module (12) are mounted in side frame panels (13)

which can be connected to the side frame panels (09; 11; 30; 50; 58) of the other modules (04; 08; 31; 47; 51).

24. Sheet-processing machine according to claim 14, characterized in that the inking unit module (12) can be arranged on other modules (08; 47; 51).

25. Sheet-processing machine according to claim 14, characterized in that the inking unit module (12) uses a cylinder (16) of the other module (08; 47; 51) as form cylinder (16) and forms a printing unit with the latter.

26. Sheet-processing machine according to claim 14, characterized in that the printing module (08, 12, 16; 47, 12, 16; 51, 12, 16) uses a transport cylinder (07; 36) of a module (04; 31) adjacent to the printing module (08, 12, 16; 47, 12, 16; 51, 12, 16) as counter-pressure cylinder (07; 36).

27. Sheet-processing machine according to claim 14, characterized in that the inking unit (12) is removably installed on the other module (08; 47; 51).

28. Sheet-processing machine according to claim 2, characterized in that the circumference of the transport cylinders (07; 17; 23; 33; 34; 36; 48; 49; 52; 53; 56; 57) are of the same size.

29. Sheet-processing machine according to claims 25 and 28, characterized in that the form cylinder (16) and the transport cylinders (07; 17; 23; 33; 34; 36; 48; 49; 52; 53; 56; 57) are of the same size.

30. Sheet-processing machine according to claim 2, characterized in that the transport cylinders (07; 36; 53; 57) of the sheet output interface (07; 36; 53; 57) and the transport cylinders (17; 32; 39; 52; 56) of the

sheet input interface (17; 32; 39; 52; 56) are arranged at the same height.

31. Sheet-processing machine according to claim 1, characterized in that the inspection module (31) comprises two transport cylinders (32; 33) which transport the sheets with respective different sides facing outwards, and comprises inspection devices (A; B) arranged with the two transport cylinders (32; 33) for inspecting the front and rear sides of the sheets, respectively.

32. Sheet-processing machine according to claim 31, characterized in that each of the inspection devices (A) comprise a respective image sensor (38) and a respective light source (37) for inspection by reflection.

33. Sheet-processing machine according to claim 31, characterized in that the inspection devices (B) comprise a UV light source and a light sensor for fluorescence produced by the UV light source.

34. Sheet-processing machine according to claim 31, 32 or 33, characterized in that the inspection devices (A; B) comprise a magnetic field sensor.

35. Sheet-processing machine according to claim 31, characterized in that a further transport cylinder (34) is provided with a further inspection device (C) for inspecting the light-transmitting capacity of the sheets.

36. Sheet-processing machine according to Claim 35, characterized in that the further transport cylinder (34) has a transparent casing, in that the inspection device (C) comprises an image sensor (44) and a light source (42) for inspection by transmission, and in that the transmitted light source (42) is arranged within the transparent casing of the transport cylinder (34).

37. Sheet-processing machine according to claim 1, characterized in that the numbering module (08) comprises at least one numbering unit (21; 22) for printing a serial number on the sheets to be processed.

38. Sheet-processing machine according to claim 37, characterized in that the numbering module (08) comprises two numbering units (21, 22) which are arranged on a counter-pressure cylinder (18) with two printing segments.